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Components	TPM	RCM
Focus on important machines	no	Yes
Creation of inspection methods for the equipment	no	Yes
Individual determination of the maintenance strategy	no	yes
Tips on the use of diagnostic methods	yes	yes
Creation of spare part management	no	only general tips
Instructions on inclusion of sub-companies	yes	No
Tips for constructive modifications	yes	Yes
Instructions for formation of redundancies	no	Yes
Tips for the speedy replacement of construction groups	yes	Yes
Description of maintenance tasks	Inspection and servicing (<u>not</u> including repairs)	Inspection and servicing (<u>not</u> including repairs)
Tips for increased productivity	no	No
Determination of time needed	no	No
Determination of implementation responsibility	Yes	Yes
Determination of implementation intervals	Yes	Yes
Employee instruction	Yes	yes
Further training for employees	Yes	yes
Adaptation of construction organization	No	No

FIG. 1
(PRIOR ART)

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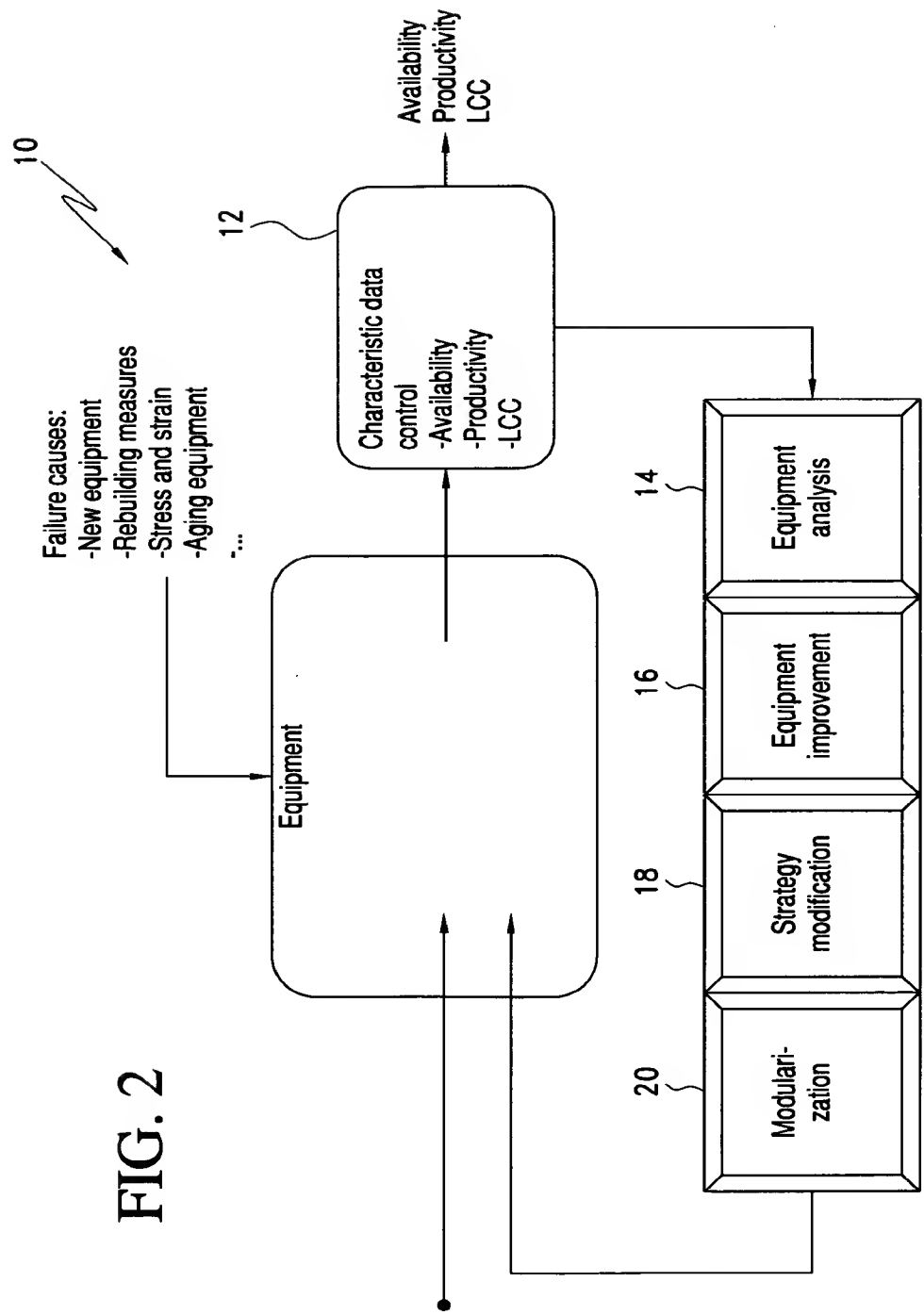


FIG. 2

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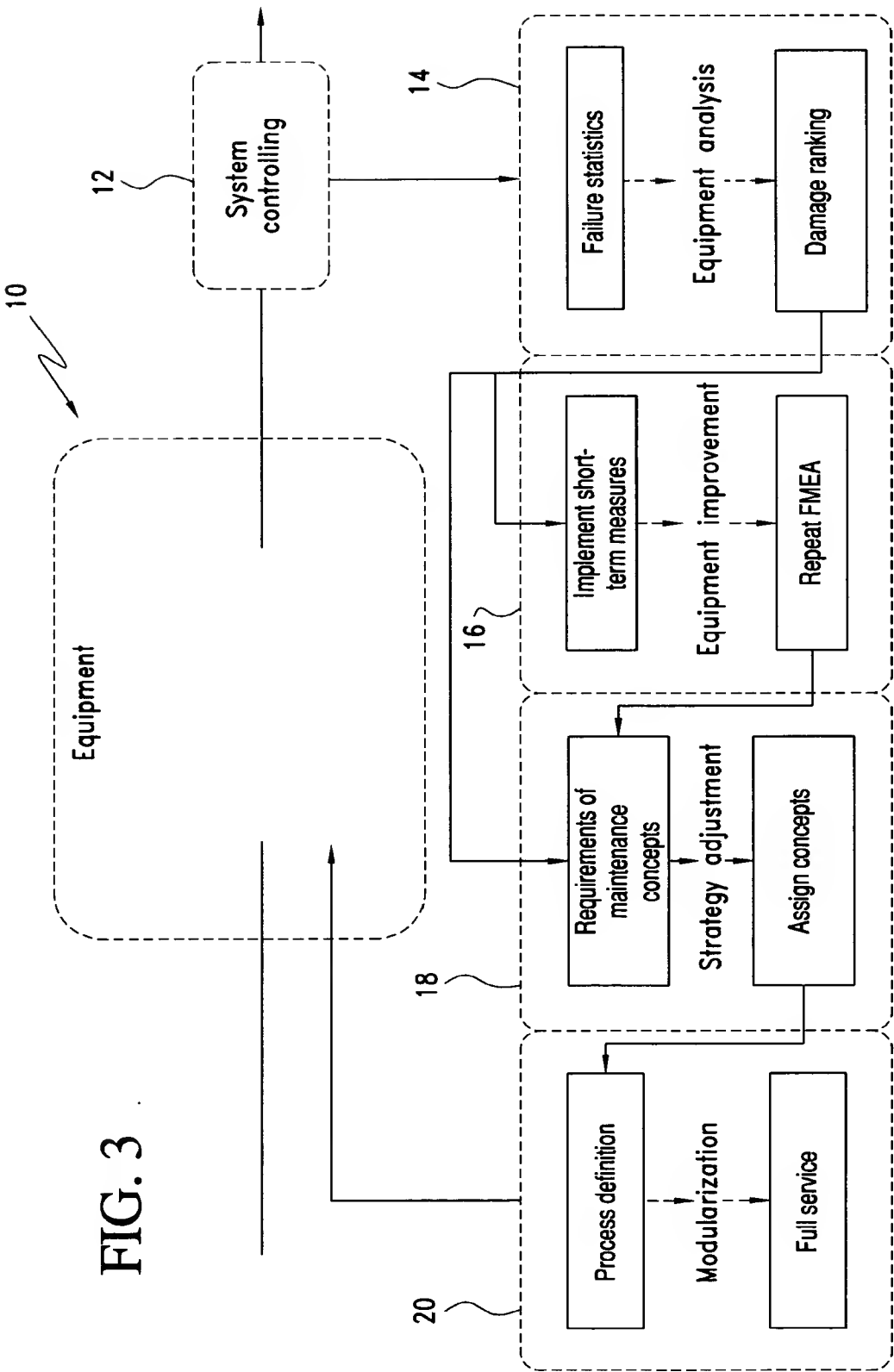
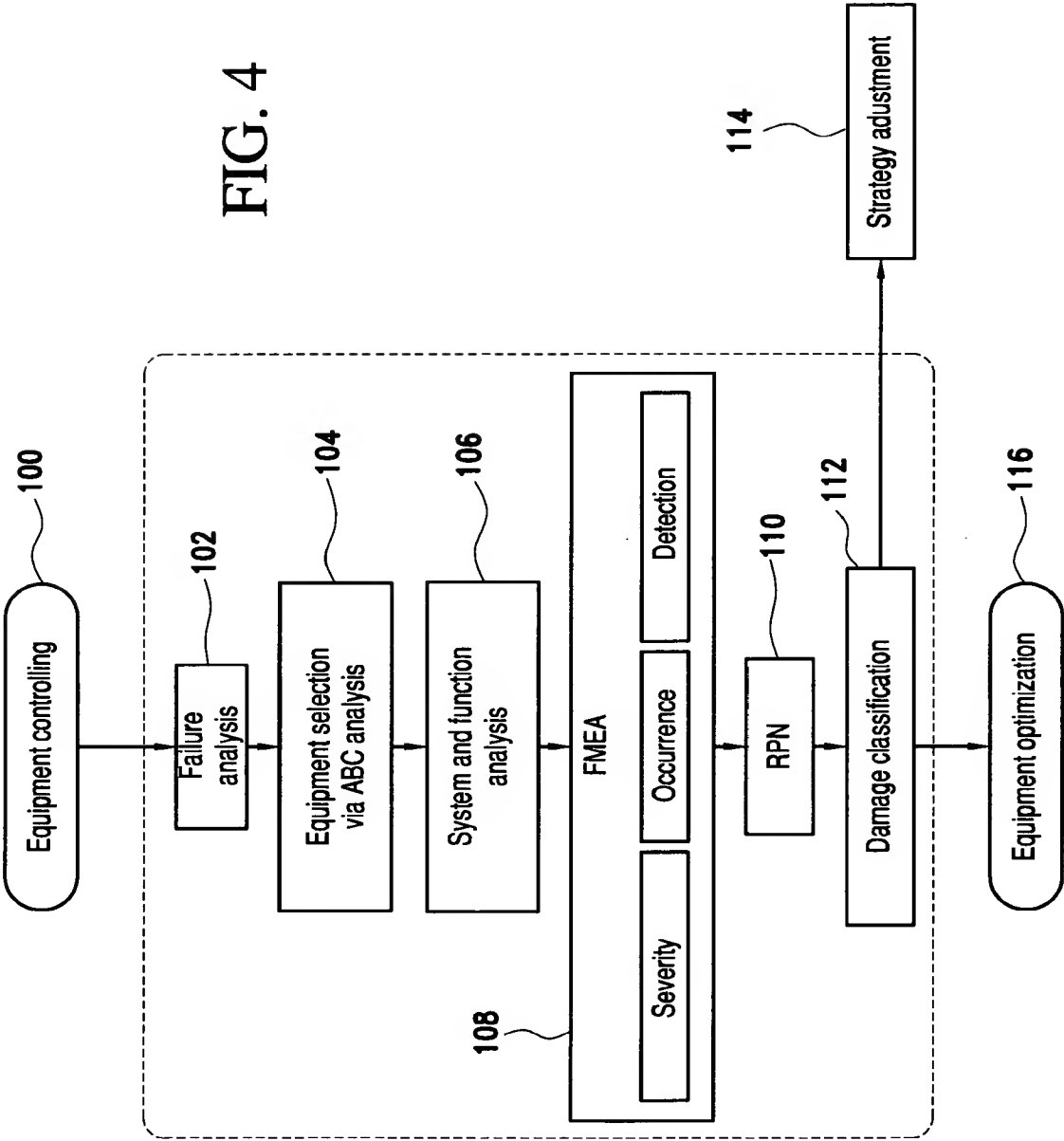
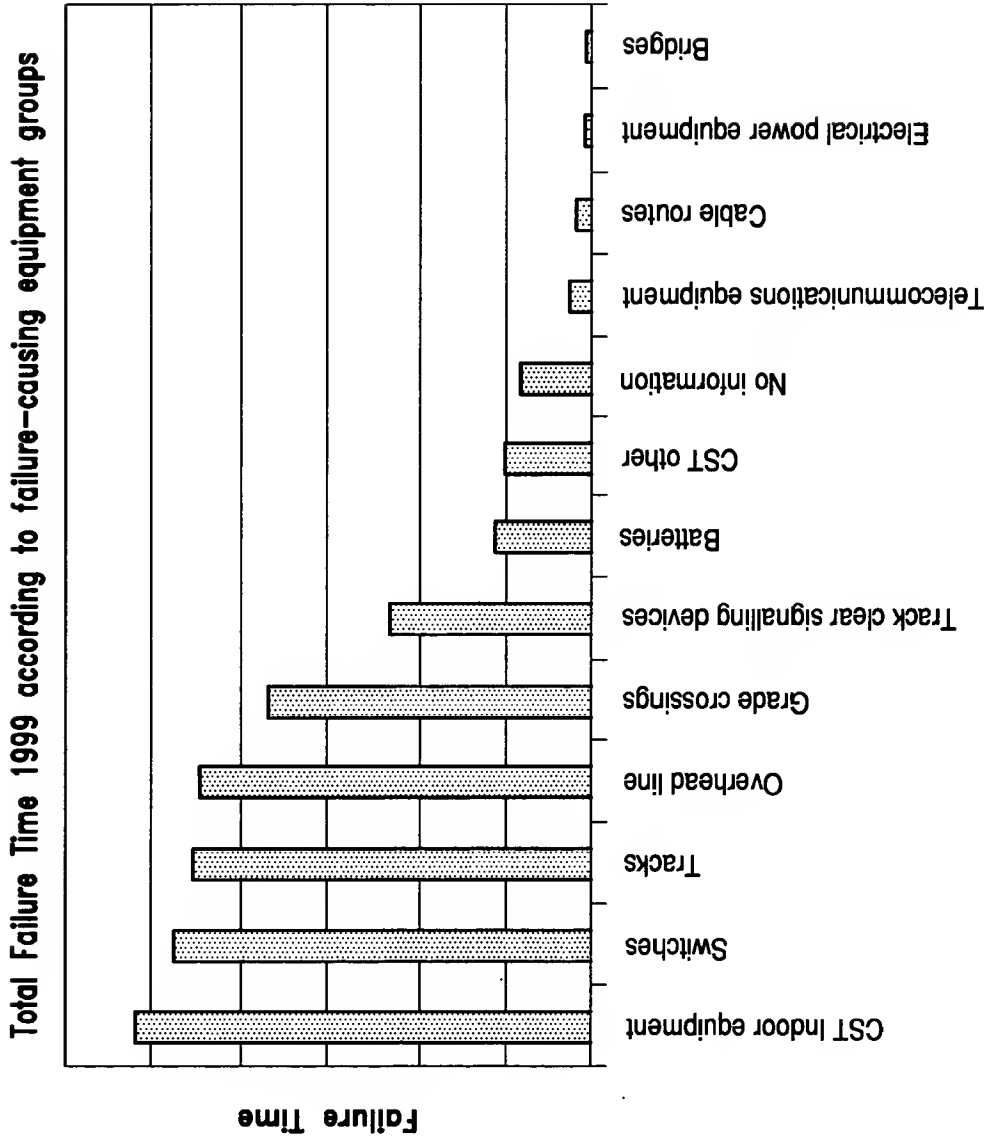


FIG. 3



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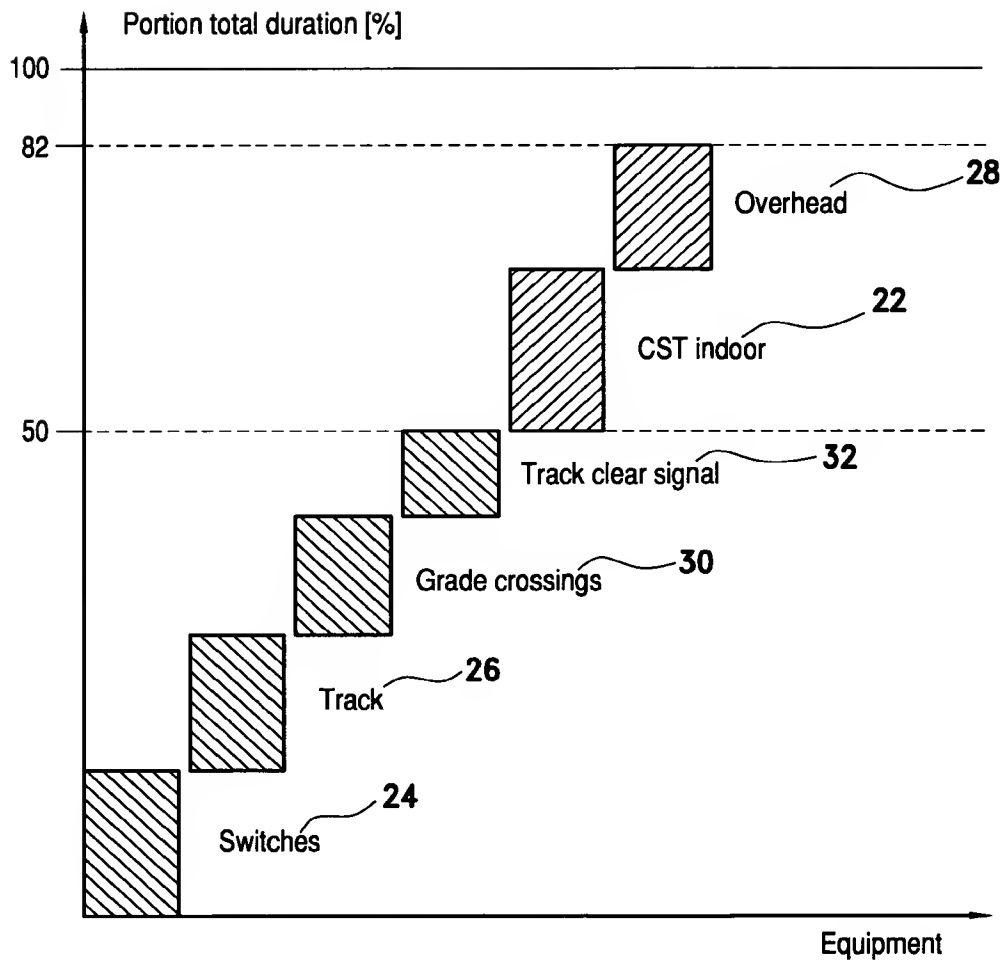
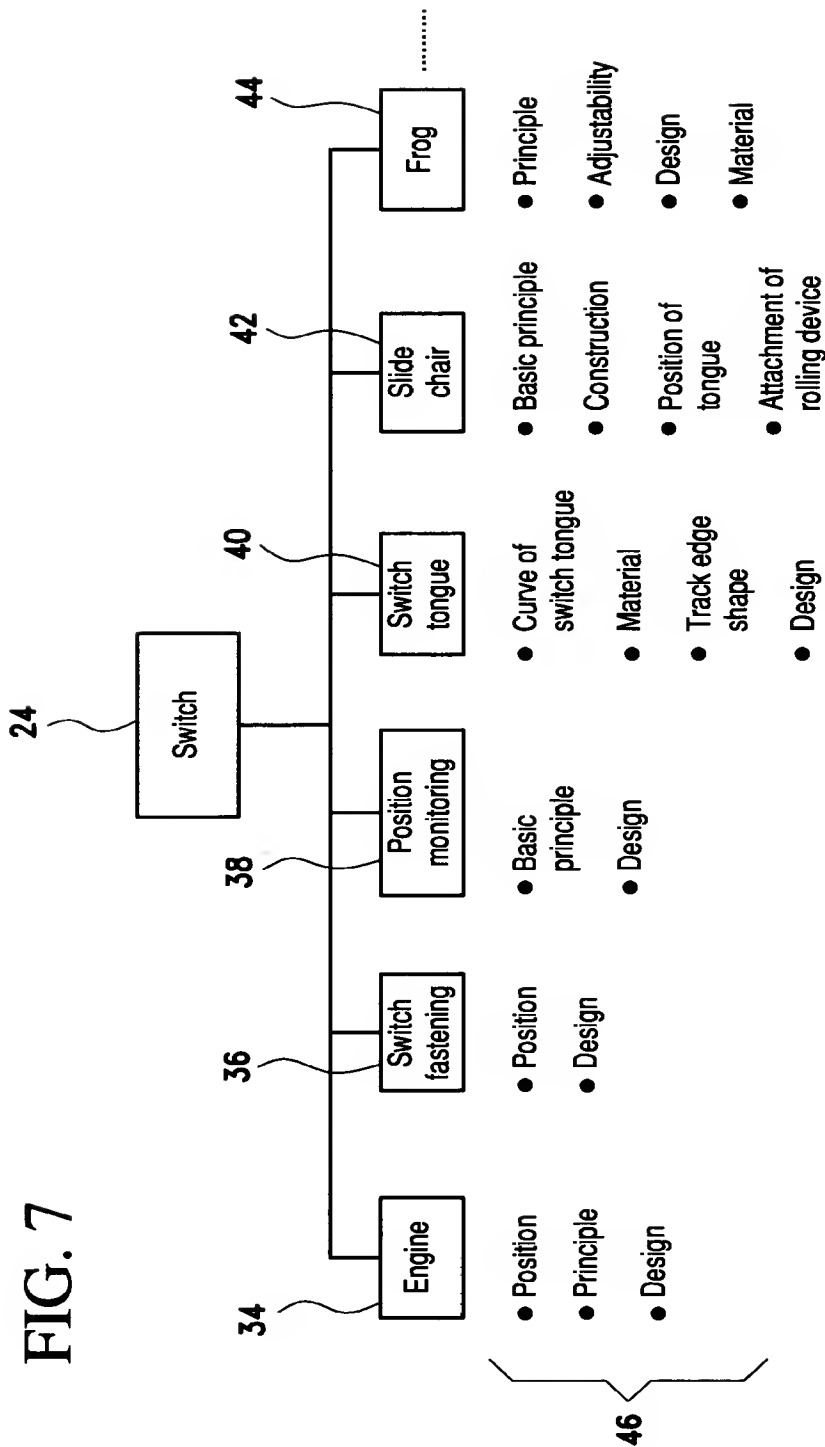


FIG. 6

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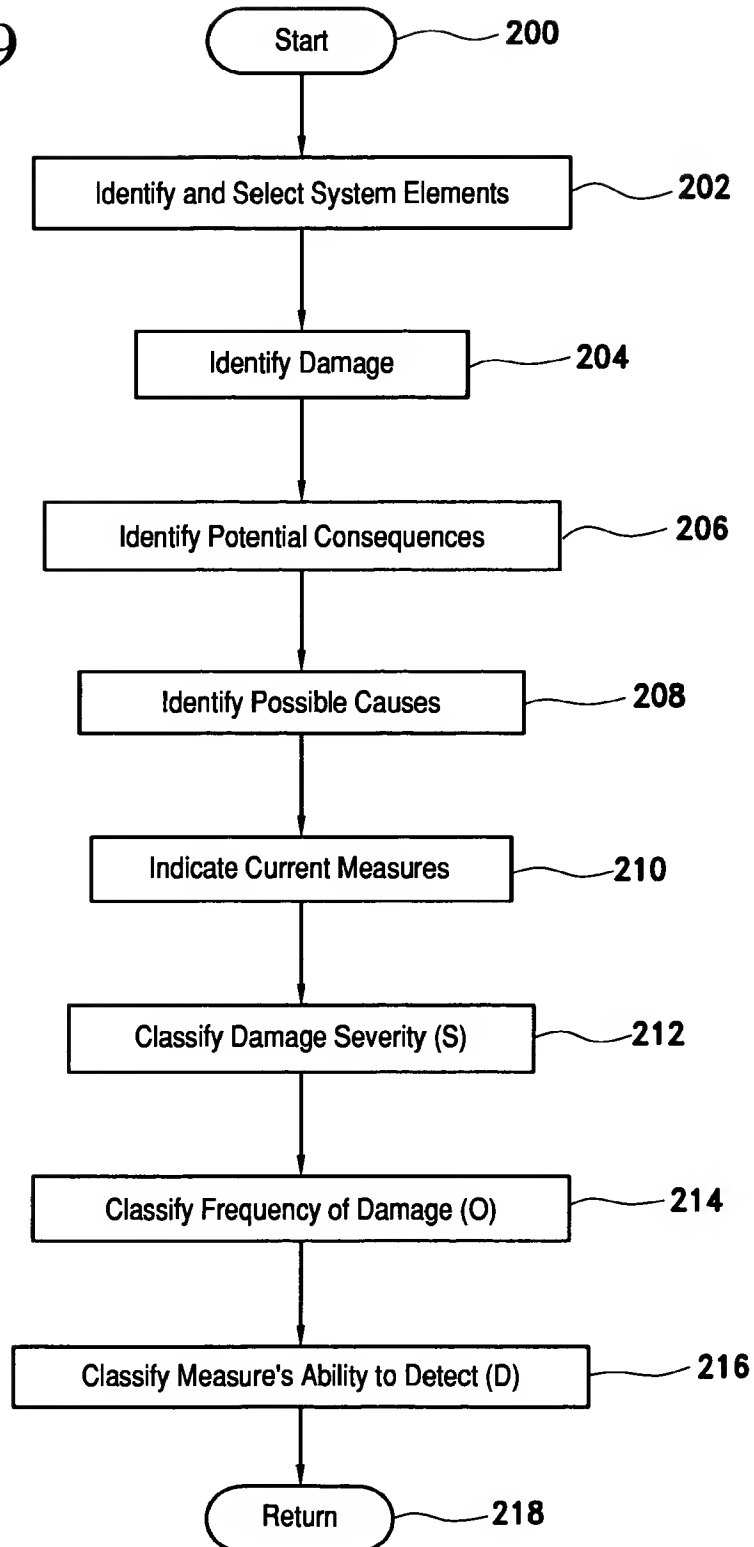
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FMEA Form		Headings			
			current status preventative -/ measures		RPN
			Current status		Improved status
		Failure Evaluation			
		Optimization Measures			
		assess data		proposals	results processing
		RPN			RPN
		Fault Analysis			
		failure effects cause			

FIG. 8

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FIG. 9



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Current Damage Cause Evaluation and Classification							
Damage Description	No.	Potential Results	S	Potential Causes (wear & tear)	O	Preventative and Inspection Measures	D RPN
Passage groove too small	1	Collision alarm through approaching of switch tongue	4	Bent switch tongue	6	Measurement of passage groove	6
	2	Broken switch tongue due to running up against switch tongue	9	Assembly defect in control mechanism	3	Acceptance inspection for maintenance work by external companies	7
	3	Wheels strike the switch tongue (overriding of the rail)	6				

FIG. 10

Current Damage Cause Evaluation and Classification								
Damage Description	No.	Potential Results	S	Potential Causes (wear & tear)	O	Preventative and Inspection Measures	D	RPN
Passage groove too small	1	Collision alarm through approaching of the switch tongue	4	Bent switch tongue	6	Measurement of passage groove	6	360
	2	Broken switch tongue due to running up against the switch tongue	9	Assembly defect in control mechanism	3	Acceptance of the repair by an outside company	7	210
	3	Wheels strike the switch tongue (overriding of rail)	10					

FIG. 11

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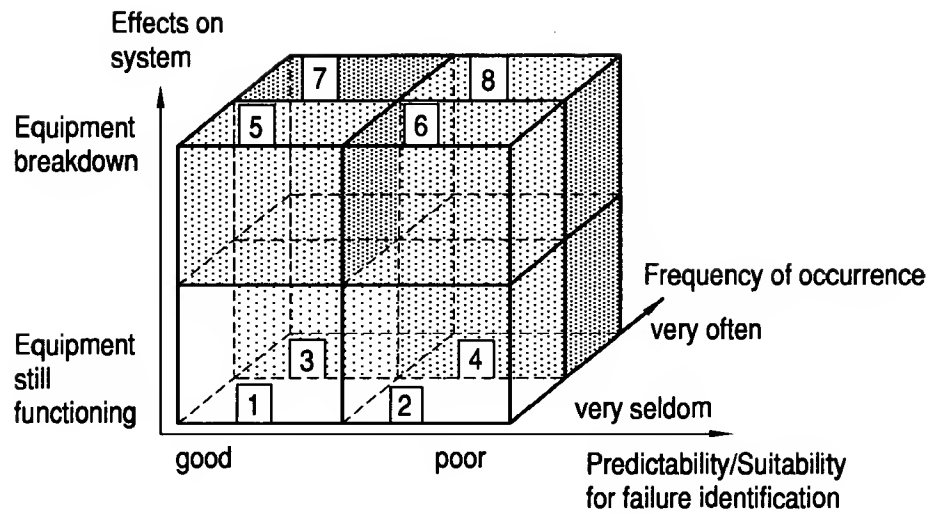


FIG. 12

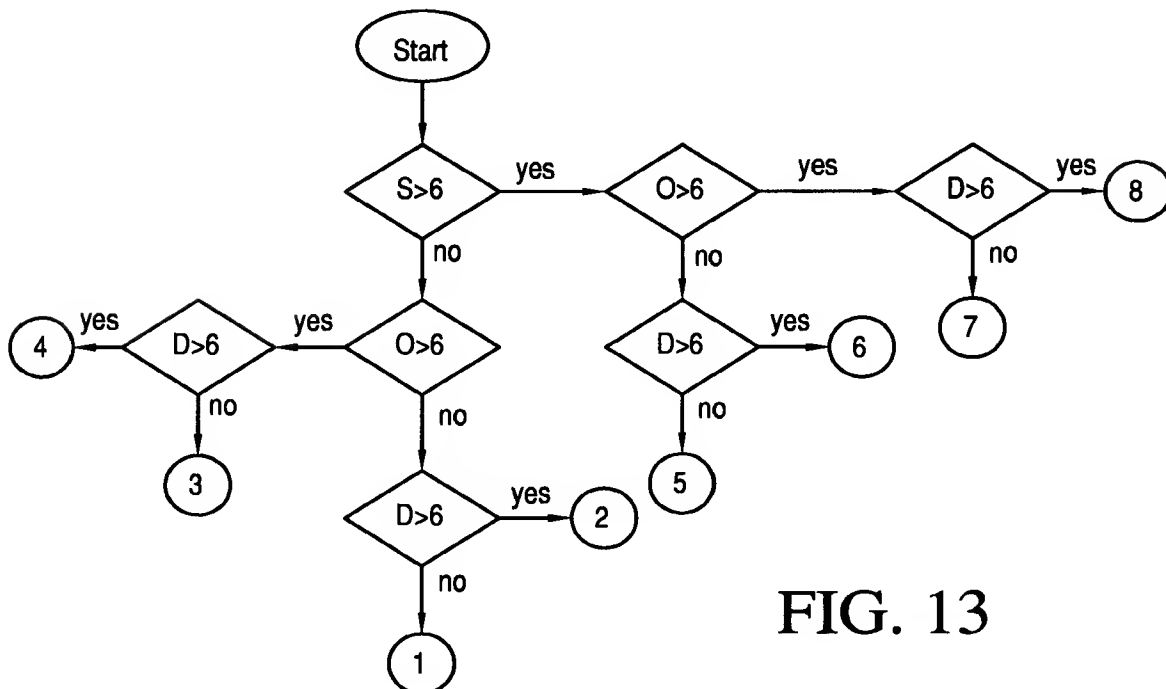


FIG. 13

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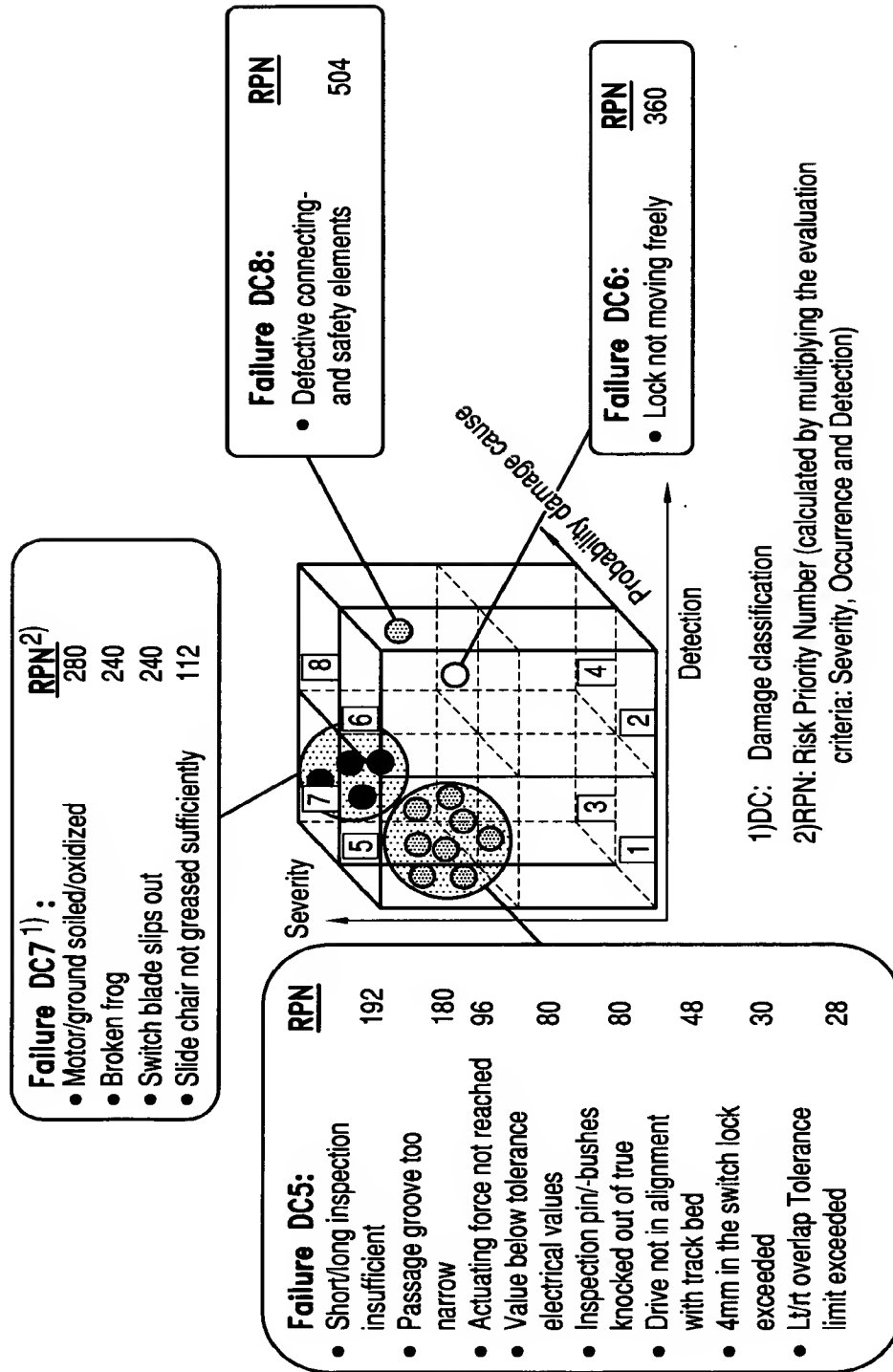
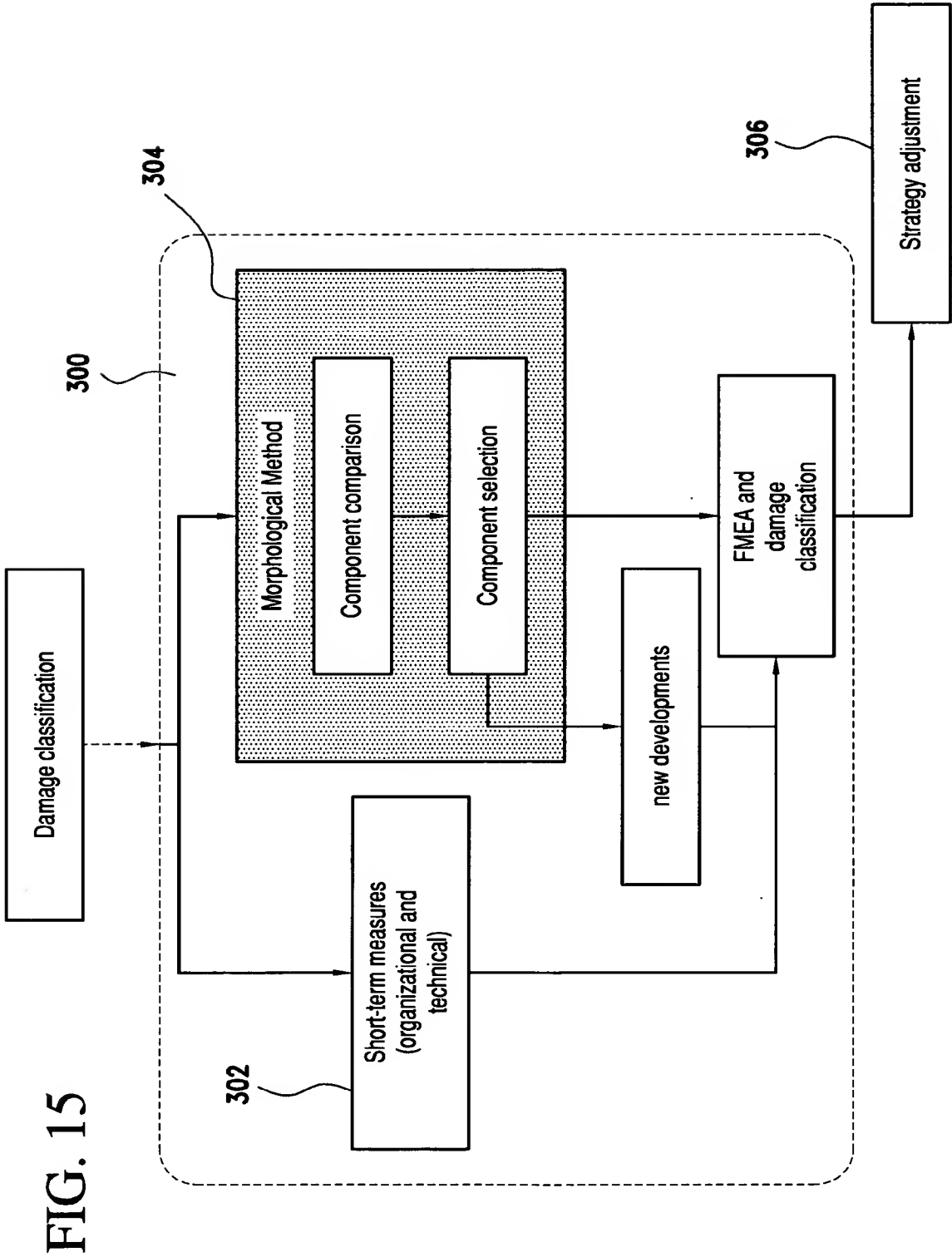


FIG. 14

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No.	Equip- ment	Problem	Measure Proposal from FMEA Workshop	In charge	Date	Comments
1.1	Switch	Stiffness of switch in interlock or due to inadequately lubricated slide chairs	Equipping of the switches with latch fastenings and roller slide chairs in critical systems	Mr. Schmitz	06/2001	Budget of DM 50,000 authorized by management
1.2	Switch	Defective connecting and locking elements	Use self-locking transmission and connecting elements	Mr. Schultz	12/2001	Only No. 237 screws to be used

FIG. 16


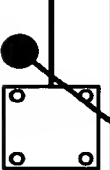
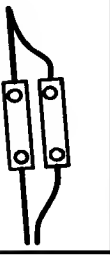
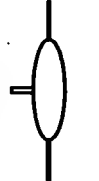


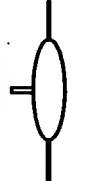














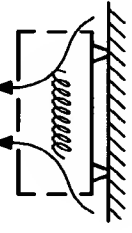
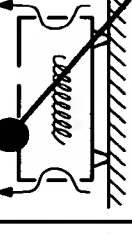
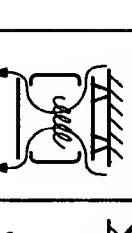
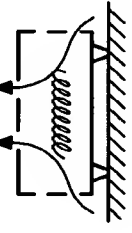
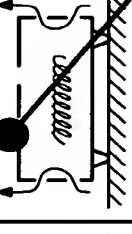
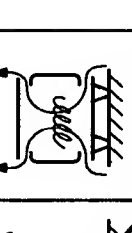
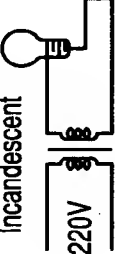
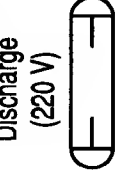
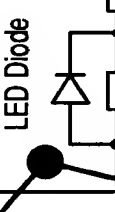
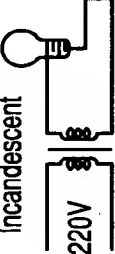
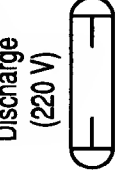
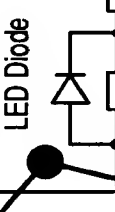
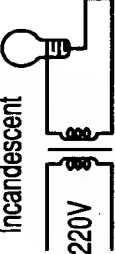
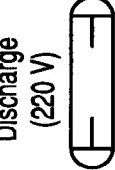
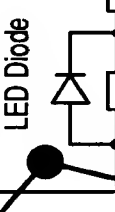
Function	Components			
Conductors (connectors)				etc.
				etc.
Circuit Switch				etc.
				etc.
Wire				etc.
				etc.
Heating Elements				etc.
				etc.
Radiator (Heat)				etc.
				etc.
Indicator Light				etc.
				etc.

FIG. 17

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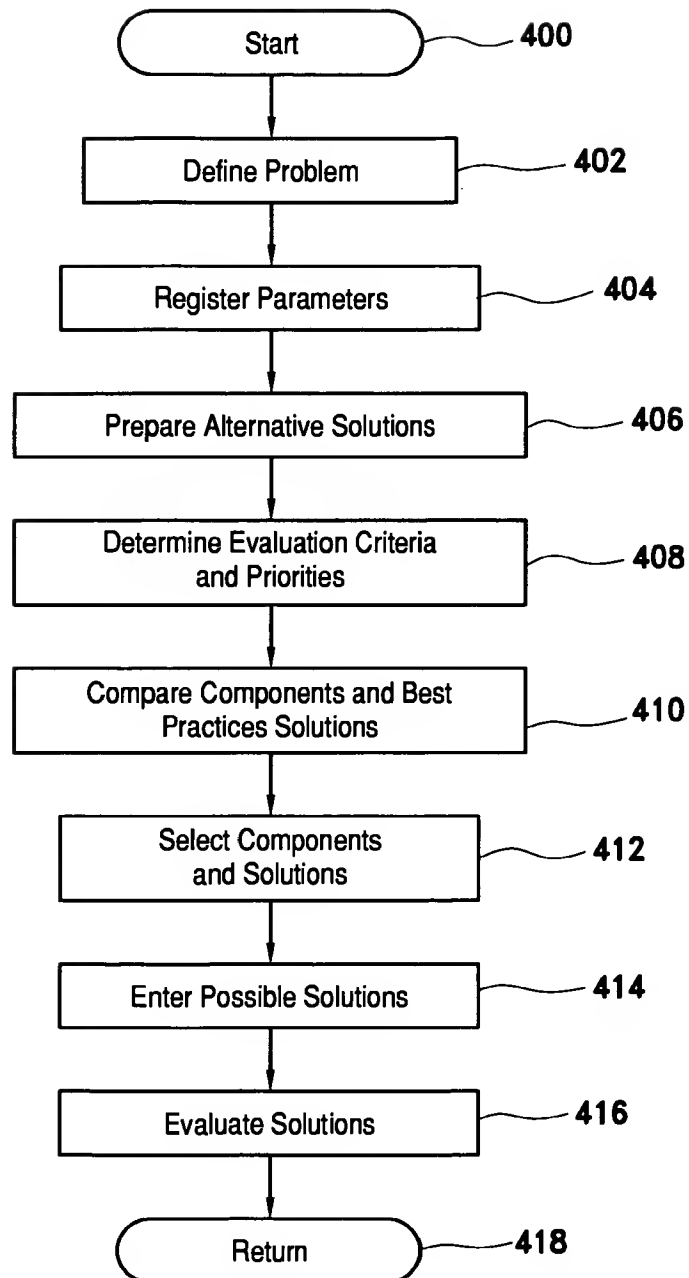


FIG. 18

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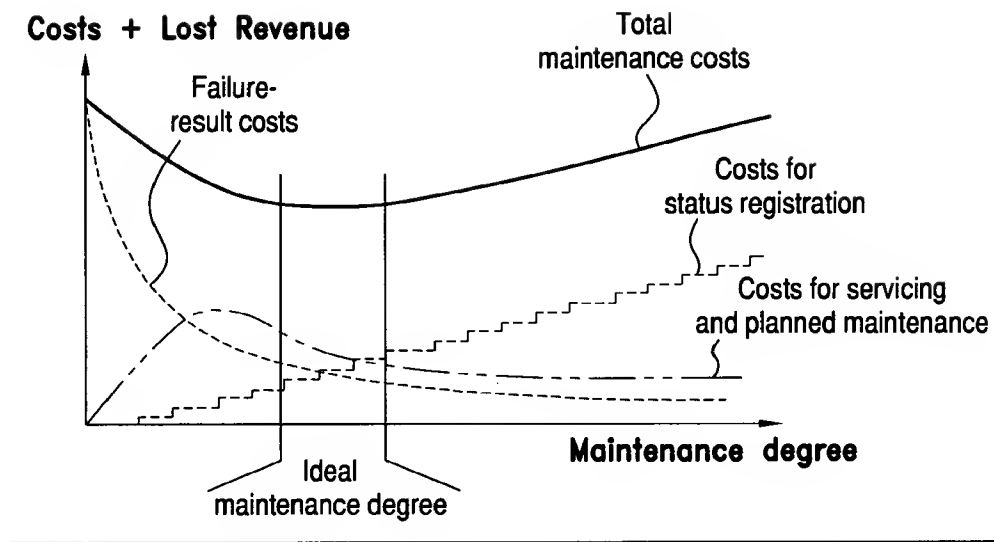


FIG. 19

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Basic conceptions	Track shape	R 65	UIC 80
	Travel surt, inclinat.	Rails with asymmetrical head with incl. 1:40	Normal rails with 1:40 inclination
	Geometrical shape	Circular arc switch	Clothoid switch
Drive	Pos.	Interior drive (integrated into tie)	Drive on outside (integrated into tie)
	Basic princ.	Electrical	Locally set mechanically
	Str. shape	Electromech. with toothed rack	Electrohydraulic power transmission
	Design	Modular design	Variably adjustable
	Basic princ.	Single drive	Central drive with hydraulic power transmiss. (Hydrolink)
Locking	Pos.	Fastening on inside	Fastening on outside in fastening tie
	Str. shape	Low-maintenance fastening (WKV) (latch fastening)	Sliding clamp fastening
	Basic princ.	interlocking of tongue tester in drive	Tongue connector rod electrically monitored
Stat. discrep. monitor.	Basic princ.	Electromech. tongue stat. discrep. monitor	Limit switch (French/Czech system)
	Peak fastening version	Status tester in drive	
	Medium fastening version	Tongue tester	R=500
	Str.	Without temp. balancing poss.	New tester rod
Clear signal	Basic princ.	Axlecounter	100 hz bond wire

FIG. 20

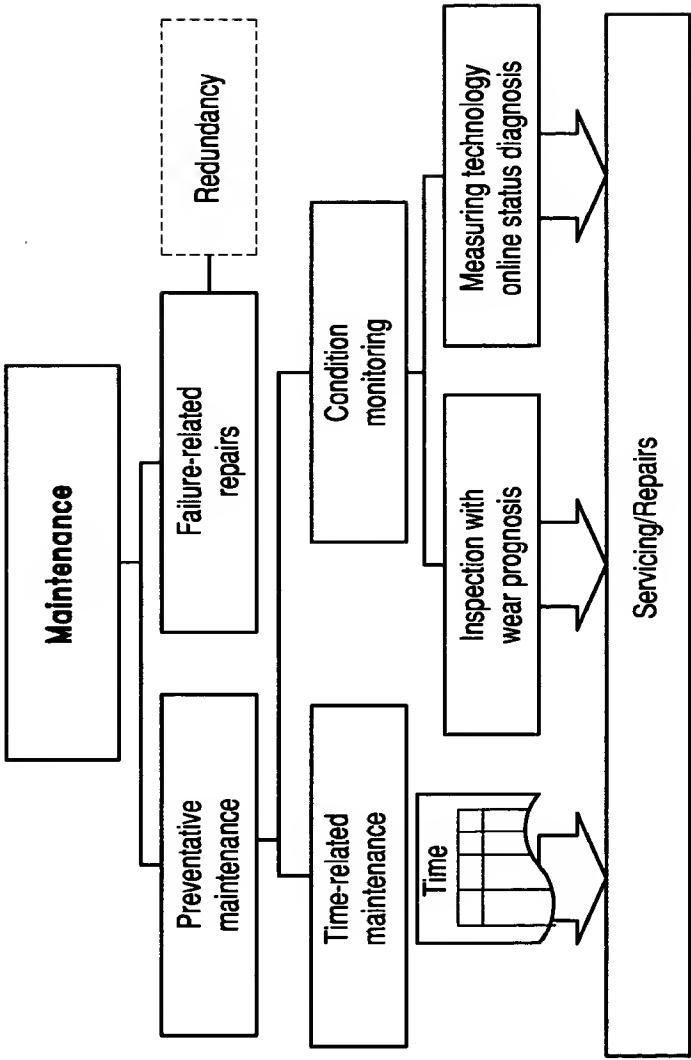
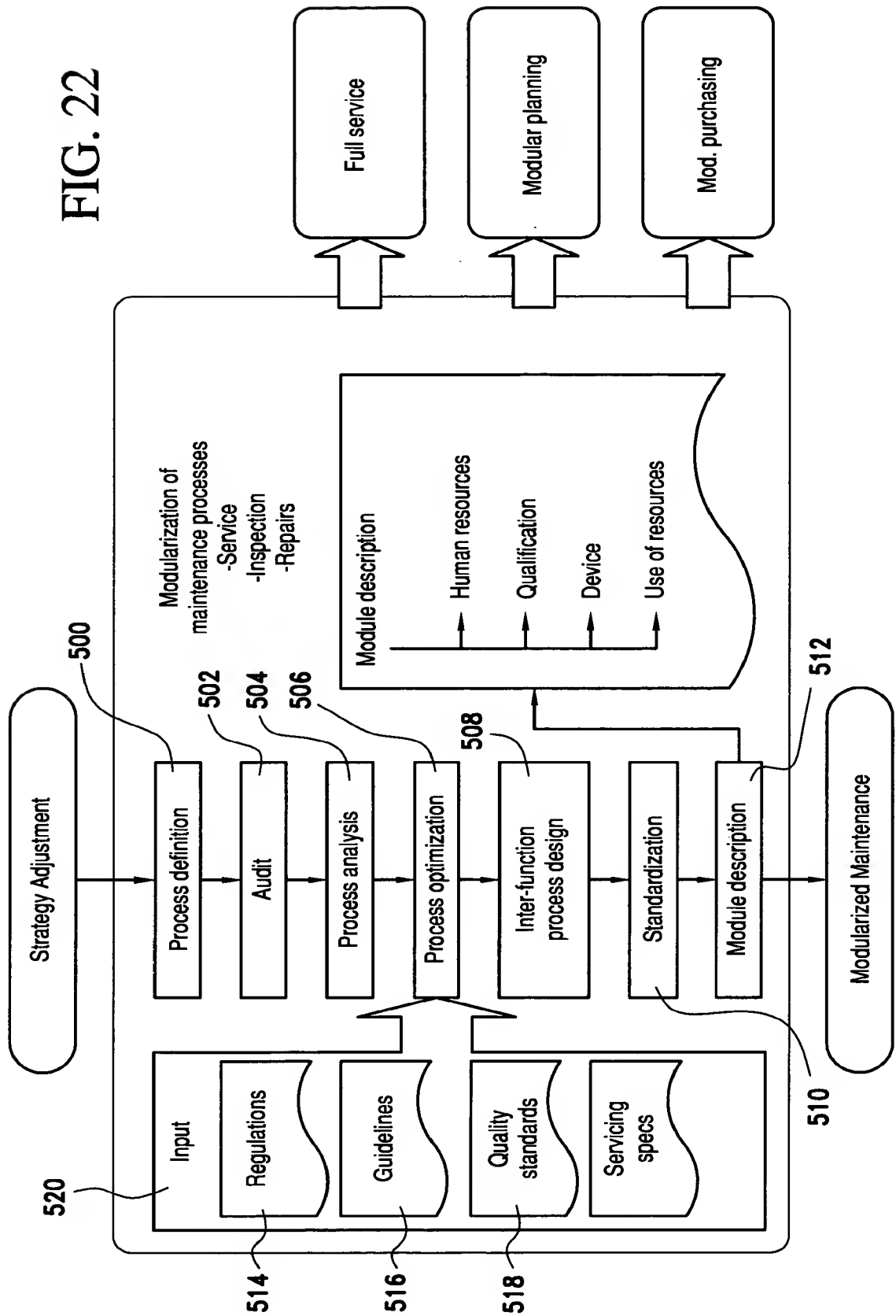


FIG. 21

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FIG. 22



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Name Module mark Module description	Weather		Network		Date		Remarks						
	Care Time	Preparatory Time	Travel Time	Waiting Time	Personnel Time	Idle Time		Lost Time	Limiting Factors	Module			
											Activity	Progress	Cell

FIG. 23

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Switches										
Module number	Module	Module contents	Machines devices additional personnel	Module time/ unit (Format minute)	Number of employees/ qualifications	Time limits acc. to load codes				
						CST 91 Tw 1 low	CST 92 Tw 1 normal	CST 92 Tw 2 normal	CST 93 Tw 3 high	CST 93 Tw 4 high
INWE 300.1.93.4	Switch 190 to 300 electr. (Time limit 1)(St)	Single switch with electric drive radius 190 to 300 m maintenance, inspection, functional check and general details acc. to DS 892.03 Appendix 02 Appendix 03		11 Mai	1 WIMech (Certif. acc. to 821.2005) 1 Wimech				1	1
INWE 300.2.92.1.2.93.3.4	Switch 190 to 300 electr. (Time limit 2)(St)	Single switch with electric drive radius 190 to 300 m maintenance, inspection, functional check and general details acc. to DS 892.03 Appendix 02 Appendix 03		14	1 WIMech (Certif. acc. to 821.2005) 1 Wimech		2	2	2	2
INWE 300.3.93.3.4+A1	Switch 190 to 300 electr. (Time limit 3)(St)	Single switch with electric drive radius 190 to 300 m maintenance, inspection, functional check and general details acc. to DS 892.03 Appendix 02 Appendix 03 Tw acc. to 821.2005		51.5	1 M tw od. 1 MA with proven 2-year testing work of measuring instrument (821.2005) 1 WIMech (Certif. acc. to 821.2005) 1 Wimech				3	3

FIG. 24

Single switch
1 electric drive
Iso joints, track
connection cables,
meshing and grounding
1 peak fastening
switch heating system

Single switch
1 electric drive
Iso joints, track
connection cables,
meshing and grounding
1 peak fastening
switch heating system

Single switch
1 electric drive
Iso joints, track
connection cables,
meshing and grounding
1 peak fastening
switch heating system

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Components	TPM	TPM	Modular- ization
Focus on machines	No	Yes	Yes
Creation of inspection methods for the equipment	No	Yes	Yes
Individual determination of the maintenance strategy	No	Yes	Yes
Tips on the use of diagnostic methods	Yes	Yes	Yes
Creation of spare part management	No	General tips	Yes
Instructions on inclusion of sub-contractors	Yes	No	Yes
Tips for constructive modification	Yes	Yes	Yes
Instructions for redundancy formation	No	Yes	Yes
Tips for the speedy replacement of construction groups	Yes	Yes	Yes
Description of maintenance tasks	Inspection + service (not incl. repairs)	Inspection + service (not incl. repairs)	Inspection + service (not incl. repairs)
Tips for increased productivity	No	No	Yes
Determination of required time	No	No	Yes
Determination of implementation responsibility	Yes	Yes	Yes
Determination of implementation intervals	Yes	Yes	Yes
Employee instruction	Yes	Yes	Yes
Further training of employees	Yes	Yes	Yes
Adaptation of construction organization	No	No	yes

FIG. 25